

Notice of Allowability

Application No.

10/079,292

Examiner

Christopher R. Magee

Applicant(s)

HASEGAWA ET AL.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Amendment after Final, filed 12/05/2005.
2. ☒ The allowed claim(s) is/are 1-25 and 78-85.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some* c) ☐ None of the:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.


Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date 10/28/2005
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____.
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.


ANGEL CASTRO
PRIMARY EXAMINER

DETAILED ACTION

Response to Amendment

1. Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.
2. The reply filed 12/05/2005 was applied to the following effect: All relevant objections and rejections are withdrawn as being satisfied.

Information Disclosure Statement

3. The information disclosure statement (IDS) submitted on 10/28/2005 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the examiner has considered the information disclosure statement.

Reasons for Allowance

4. Claims 1-25 and 78-85 are allowed.

The following is an examiner's statement of reasons for allowance:

This application is for an EXCHANGE COUPLED HAVING CURRENT CARRYING RELIABILITY AND IMPROVED RATE OF CHANGE IN RESISTANCE AND MAGNETIC SENSING ELEMENT USING THE SAME.

- **Claim 1** specifies an exchange coupled film, which requires:

“wherein a crystal structure of the seed layer is a face centered cubic structure and substantially a single phase, and wherein a body-centered cubic structure is substantially not present.”

The closest prior art of record, Gill (US 6,456,469 B1) in view of Lee et al. (hereinafter Lee) (US 5,731, 936), fails to fairly, teach, show or suggest, by either anticipating or rendering obvious, the invention as set forth in the claims of the instant application. Furthermore, a search made does not detect the combined claimed elements as set forth in the pending claims. Additionally, the reasons for allowance of the claims over the prior art of record is believed to be readily clear, self evident and apparent from the claim language set forth in each of claim 1, when compared and contrasted with the prior art.

More particularly, the instant invention (as set forth in claim 1) provides for a crystal structure of the seed layer is a face centered cubic structure and substantially a single phase, and wherein a body-centered cubic structure is substantially not present. None of the cited prior art of record, however, do not disclose such a seed layer, as set forth in the manner, function and relationship relative to other claimed structures as prescribed by the independent claim 1.

- **Claim 79** specifies an exchange coupled film, which requires:

“wherein grain boundaries formed in the antiferromagnetic layer and grain boundaries formed in the ferromagnetic layer which appear in a cross section of the exchange coupled film parallel to a thickness direction are at least partially discontinuous at the interface between the antiferromagnetic layer and the ferromagnetic layer.”

The closest prior art of record, Gill (US 6,456,469 B1) in view of Lee et al. (hereinafter Lee) (US 5,731, 936), fails to fairly, teach, show or suggest, by either anticipating or rendering obvious, the invention as set forth in the claims of the instant application. Furthermore, a search made does not detect the combined claimed elements as set forth in the pending claims. Additionally, the reasons for allowance of the claims over the prior art of record is believed to be

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readily clear, self evident and apparent from the claim language set forth in each of claim 79, when compared and contrasted with the prior art.

More particularly, the instant invention (as set forth in claim 79) provides for grain boundaries formed in the antiferromagnetic layer and grain boundaries formed in the ferromagnetic layer which appear in a cross section of the exchange coupled film parallel to a thickness direction are at least partially discontinuous at the interface between the antiferromagnetic layer and the ferromagnetic layer. None of the cited prior art of record, however, do not disclose such an exchange coupled film, as set forth in the manner, function and relationship relative to other claimed structures as prescribed by the independent claim 79.

- **Claim 80** specifies an exchange coupled film, which requires:

“wherein grain boundaries formed in the antiferromagnetic layer and grain boundaries formed in the seed layer which appear in a cross section of the exchange coupled film parallel to a thickness direction are at least partially discontinuous at the interface between the antiferromagnetic layer and the seed layer.”

The closest prior art of record, Gill (US 6,456,469 B1) in view of Lee et al. (hereinafter Lee) (US 5,731, 936), fails to fairly, teach, show or suggest, by either anticipating or rendering obvious, the invention as set forth in the claims of the instant application. Furthermore, a search made does not detect the combined claimed elements as set forth in the pending claims. Additionally, the reasons for allowance of the claims over the prior art of record is believed to be readily clear, self evident and apparent from the claim language set forth in each of claim 80, when compared and contrasted with the prior art.

More particularly, the instant invention (as set forth in claim 80) provides for grain boundaries formed in the antiferromagnetic layer and grain boundaries formed in the seed layer

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which appear in a cross section of the exchange coupled film parallel to a thickness direction are at least partially discontinuous at the interface between the antiferromagnetic layer and the seed layer. None of the cited prior art of record, however, do not disclose such an exchange coupled film, as set forth in the manner, function and relationship relative to other claimed structures as prescribed by the independent claim 80.

- **Claim 81** specifies an exchange coupled film, which requires:

“wherein equivalent crystal planes represented as {111} planes in the antiferromagnetic layer and ferromagnetic layer are preferentially oriented as crystal planes parallel to the interface between the antiferromagnetic layer and the ferromagnetic layer, and at least some of the equivalent crystal axes in the crystal planes are directed in different directions between the antiferromagnetic layer and ferromagnetic layer.”

The closest prior art of record, Gill (US 6,456,469 B1) in view of Lee et al. (hereinafter Lee) (US 5,731, 936), fails to fairly, teach, show or suggest, by either anticipating or rendering obvious, the invention as set forth in the claims of the instant application. Furthermore, a search made does not detect the combined claimed elements as set forth in the pending claims. Additionally, the reasons for allowance of the claims over the prior art of record is believed to be readily clear, self evident and apparent from the claim language set forth in each of claim 81, when compared and contrasted with the prior art.

More particularly, the instant invention (as set forth in claim 81) provides for equivalent crystal planes represented as {111} planes in the antiferromagnetic layer and ferromagnetic layer are preferentially oriented as crystal planes parallel to the interface between the antiferromagnetic layer and the ferromagnetic layer, and at least some of the equivalent crystal axes in the crystal planes are directed in different directions between the antiferromagnetic layer

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and ferromagnetic layer. None of the cited prior art of record, however, do not disclose such an exchange coupled film, as set forth in the manner, function and relationship relative to other claimed structures as prescribed by the independent claim 81.

- **Claim 82** specifies an exchange coupled film, which requires:

“wherein equivalent crystal planes represented as {111} planes in the antiferromagnetic layer and seed layer are preferentially oriented as crystal planes parallel to the interface between the antiferromagnetic layer and the seed layer, and at least some of the equivalent crystal axes in the crystal planes are directed in different directions between the antiferromagnetic layer and seed layer.”

The closest prior art of record, Gill (US 6,456,469 B1) in view of Lee et al. (hereinafter Lee) (US 5,731, 936), fails to fairly, teach, show or suggest, by either anticipating or rendering obvious, the invention as set forth in the claims of the instant application. Furthermore, a search made does not detect the combined claimed elements as set forth in the pending claims. Additionally, the reasons for allowance of the claims over the prior art of record is believed to be readily clear, self evident and apparent from the claim language set forth in each of claim 82, when compared and contrasted with the prior art.

More particularly, the instant invention (as set forth in claim 82) provides for equivalent crystal planes represented as {111} planes in the antiferromagnetic layer and seed layer are preferentially oriented as crystal planes parallel to the interface between the antiferromagnetic layer and the seed layer, and at least some of the equivalent crystal axes in the crystal planes are directed in different directions between the antiferromagnetic layer and seed layer. None of the cited prior art of record, however, do not disclose such an exchange coupled film, as set forth in

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the manner, function and relationship relative to other claimed structures as prescribed by the independent claim 82.

- **Claim 83** specifies an exchange coupled film, which requires:

“wherein the X-Mn-X’ alloy is one of an interstitial solid solution in which atoms of X’ enter interstices in a space lattice comprising X and Mn and a substitutional solid solution in which atoms of X’ are substituted for some atoms at lattice points of a crystal lattice comprising X and Mn.”

The closest prior art of record, Gill (US 6,456,469 B1) in view of Lee et al. (hereinafter Lee) (US 5,731, 936), fails to fairly, teach, show or suggest, by either anticipating or rendering obvious, the invention as set forth in the claims of the instant application. Furthermore, a search made does not detect the combined claimed elements as set forth in the pending claims. Additionally, the reasons for allowance of the claims over the prior art of record is believed to be readily clear, self evident and apparent from the claim language set forth in each of claim 83, when compared and contrasted with the prior art.

More particularly, the instant invention (as set forth in claim 83) provides for the X-Mn-X’ alloy is one of an interstitial solid solution in which atoms of X’ enter interstices in a space lattice comprising X and Mn and a substitutional solid solution in which atoms of X’ are substituted for some atoms at lattice points of a crystal lattice comprising X and Mn. None of the cited prior art of record, however, do not disclose such an exchange coupled film, as set forth in the manner, function and relationship relative to other claimed structures as prescribed by the independent claim 83.

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- **Claim 84** specifies an exchange coupled film, which requires:

“wherein the antiferromagnetic layer comprises X and Mn, wherein X is at least one element selected from the group consisting of Pt, Pd, Ir, Rh, Ru and Os, and wherein a X content is 45 to 60 percent.”

The closest prior art of record, Gill (US 6,456,469 B1) in view of Lee et al. (hereinafter Lee) (US 5,731, 936), fails to fairly, teach, show or suggest, by either anticipating or rendering obvious, the invention as set forth in the claims of the instant application. Furthermore, a search made does not detect the combined claimed elements as set forth in the pending claims. Additionally, the reasons for allowance of the claims over the prior art of record is believed to be readily clear, self evident and apparent from the claim language set forth in each of claim 84, when compared and contrasted with the prior art.

More particularly, the instant invention (as set forth in claim 84) provides for the antiferromagnetic layer comprises X and Mn, wherein X is at least one element selected from the group consisting of Pt, Pd, Ir, Rh, Ru and Os, and wherein a X content is 45 to 60 percent. None of the cited prior art of record, however, do not disclose such an antiferromagnetic layer, as set forth in the manner, function and relationship relative to other claimed structures as prescribed by the independent claim 84.

- **Claim 85** specifies an exchange coupled film, which requires:

“wherein the antiferromagnetic layer comprises X-Mn-X’ alloy, wherein X is at least one element selected from the group consisting of Pt, Pd, Ir, Rh, Ru and Os, and X’ is at least one element selected from the group consisting of Ne, Ar, Kr, Xe, Be, B, C, N, Mg, Al, Is, P, Ti, V, Cr, Fe, Co, Ni, Cu, Zn, Ga, Ge, Zr, Nb, Mo, Ag, Cd, Ir, Sn, Hf, Ta, W, Re, Au, Pb and rare earth elements, and wherein a X + X’ content is 45 to 60 percent.”

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The closest prior art of record, Gill (US 6,456,469 B1) in view of Lee et al. (hereinafter Lee) (US 5,731, 936), fails to fairly, teach, show or suggest, by either anticipating or rendering obvious, the invention as set forth in the claims of the instant application. Furthermore, a search made does not detect the combined claimed elements as set forth in the pending claims. Additionally, the reasons for allowance of the claims over the prior art of record is believed to be readily clear, self evident and apparent from the claim language set forth in each of claim 85, when compared and contrasted with the prior art.

More particularly, the instant invention (as set forth in claim 85) provides for the antiferromagnetic layer comprises X-Mn-X' alloy, wherein X is at least one element selected from the group consisting of Pt, Pd, Ir, Rh, Ru and Os, and X' is at least one element selected from the group consisting of Ne, Ar, Kr, Xe, Be, B, C, N, Mg, Al, Si, P, Ti, V, Cr, Fe, Co, Ni, Cu, Zn, Ga, Ge, Zr, Nb, Mo, Ag, Cd, Ir, Sn, Hf, Ta, W, Re, Au, Pb and rare earth elements, and wherein a X + X' content is 45 to 60 percent. None of the cited prior art of record, however, do not disclose such an antiferromagnetic layer, as set forth in the manner, function and relationship relative to other claimed structures as prescribed by the independent claim 85.

5. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion


6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher R. Magee whose telephone number is (571) 272-7592. The examiner can normally be reached on M-F, 8: 00 am-5: 30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Korzuch can be reached on (571) 272-7589. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Christopher R. Magee
Patent Examiner
Art Unit 2653

December 20, 2005
crm


ANGEL CASTRO
PRIMARY EXAMINER